UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/797,925	03/10/2004	Andreas Lopp	SANZ-253	3357

24972 7590 09/19/2007
FULBRIGHT & JAWORSKI, LLP
666 FIFTH AVE
NEW YORK, NY 10103-3198

EXAMINER	
BAND, MICHAEL A	
ART UNIT	**PAPER NUMBER**
1753	

MAIL DATE	DELIVERY MODE
09/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/797,925	LOPP ET AL.	
	Examiner	Art Unit	
	Michael Band	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 July 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. Claims 1-7, 9-15, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrison, Jr. (US Patent No. 4,461,688) in view of Lehan (WO 96/21750) and Hughes et al (US Patent No. 5,873,989).

With respect to claim 1, Morrison '688 discloses a magnetron and target (abstract, lines 1-2; figure 5, part 12) with the magnetron comprising a magnet system with at least one inner magnet and at least one outer magnet (figure 5, parts 46'52'). This magnet system forms at least one closed plasma tube (i.e. plasma loop or plasma path) between an inner and outer magnet (abstract, lines 10-14 and lines 19-20). Between the inner and outer magnets, there exist two regions at a distance from one another as evidenced by the space between either S and N poles or N and N poles (figure 5).

However Morrison '688 is limited in that there is no description or illustration to display the shape of the plasma tube.

Lehan '750 displays a plasma racetrack (figure 2B) schematically similar in design to applicant with dimensions "W_L" (i.e. "d") and "D_P" (i.e. "B"/2). This type of design reduces erosion of a target at the end portions while the magnetic field at the ends need not be significantly reduced, leading to maintained efficiency of magnetron (abstract).

It would have been obvious to one of ordinary skill in the art to use the plasma racetrack taught in Lehan '750 as the plasma tube in Morrison '688 in order to gain the advantages of reduced erosion of the end portions of target while not reducing the magnetic field and thus, maintaining magnetron efficiency and one of ordinary skill would have a reasonable expectation of success in making such a modification.

However Morrison '688 is limited in that the magnets do not move over the target.

Hughes '989 teaches a sputtering magnetron contained inside a vacuum chamber capable of moving linearly across a target and utilizing a plasma tube. The abstract discloses "a magnet assembly disposed in proximity of the target" (abstract, lines 3-4) and "a drive assembly for scanning (i.e. moving) the magnet assembly relative to the target" (abstract, lines 5-6) in order for the magnet to sputter more of the target area.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a moving magnetron relative to target and plasma race-track taught in Hughes '989 as part of the sputtering magnetron apparatus in Morrison '688 in order to gain the advantages of increased efficiency in uniform erosion of the target well known in the art and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claim 2, Morrison '688 discloses a magnetron and target (abstract, lines 1-2; figure 5, part 12) with the magnetron comprising a magnet system with at least one inner magnet and at least one outer magnet (figure 5, parts 46'52').

This magnet system forms at least one closed plasma tube (i.e. plasma loop or plasma path) between an inner and outer magnet (abstract, lines 10-14 and lines 19-20). Between the inner and outer magnets, there exist two regions at a distance from one another as evidenced by the space between either S and N poles or N and N poles (figure 5).

However Morrison '688 is limited in that there is no description or illustration to display the shape of the plasma tube.

Lehan '750 displays a plasma racetrack (figure 2B) schematically similar in design to applicant with dimensions "W_L" (i.e. "d") and "D_P" (i.e. "B"/2). This type of design reduces erosion of a target at the end portions while the magnetic field at the ends need not be significantly reduced, leading to maintained efficiency of magnetron (abstract). Since "B" was obviously less than "d" as discussed, "B" greater than or equal to "2d" must hold true if both "B" and "d" are greater than one.

It would have been obvious to one of ordinary skill in the art to use the plasma racetrack taught in Lehan '750 as the plasma tube in Morrison '688 in order to gain the advantages of reduced erosion of the end portions of target while not reducing the magnetic field and thus, maintaining magnetron efficiency and one of ordinary skill would have a reasonable expectation of success in making such a modification.

However Morrison '688 is limited in that the magnets do not move over the target.

Hughes '989 teaches a sputtering magnetron contained inside a vacuum chamber capable of moving linearly across a target and utilizing a plasma tube. The

abstract discloses "a magnet assembly disposed in proximity of the target" (abstract, lines 3-4) and "a drive assembly for scanning (i.e. moving) the magnet assembly relative to the target" (abstract, lines 5-6) in order for the magnet to sputter more of the target area.

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a moving magnetron relative to target and plasma race-track taught in Hughes '989 as part of the sputtering magnetron apparatus in Morrison '688 in order to gain the advantages of increased efficiency in uniform erosion of the target well known in the art and one of ordinary skill in the art would have a reasonable expectation of success in making such a modification.

With respect to claims 3 and 11, Morrison '688 further discloses figure 11 having magnetic fields A and B. In between A and B, two significantly smaller fields are seen. There exists a certain distance between parts 120/132 and parts 108/130 (i.e. distance C) that separates the two. The horizontal midpoint of each white space between parts 120/132 and parts 108/130 represents the endpoints of the certain distance (i.e. distance C). According to the drawing, the magnetic fields present in figure 11 are similar to the fields depicted in the application drawings. In figure 11 it appears that at either contrived endpoint, the component of the magnetic field perpendicular to the surface of the target is zero.

With respect to claims 4 and 12, Morrison '688 further discloses figure 11 that has smaller magnetic fields between magnetic fields A and B, forming a semi-oval from the points at which the smaller magnetic fields intersect the target. Figure 3 displays

prior art with a schematically similar magnetic arrangement as that of Morrison '688. The acute angle present is 45°.

However Morrison '688 is limited in that figure 3 displays an angle of 45°, while applicant claims an angle of 20°.

It has been held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984).

Therefore it would have been obvious to one of ordinary skill in the art to have the magnetic field form a plurality of angles, including 20° and 45°, and one of ordinary skill would have a reasonable expectation of success in making the modification.

With respect to claims 5 and 13, Morrison '688 further discloses a "closed plasma loop" (abstract; col. 7, lines 61-68; col. 8, lines 1-9) that is schematically similar to the plasma tube described by application. From figure 11, the smaller magnetic fields between magnetic fields A and B, a semi-oval is formed from the points at which the smaller magnetic fields intersect the target. The angles formed from these intersections are acute angles. Figure 2 in Morrison '688 displays the magnetic field forming an angle of 45° with that of the target.

However Morrison '688 is limited in that figure 2 displays an angle of 45°, while applicant claims an angle of 20°.

It has been held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device. Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984).

Therefore it would have been obvious to one of ordinary skill in the art to have the magnetic field form a plurality of angles, including 20° and 45°, and one of ordinary skill would have a reasonable expectation of success in making the modification.

With respect to claims 6 and 14, Hughes '989 further discloses that the magnet assembly that "is linearly scanned (i.e. moved) by the drive assembly along a scan direction relative to target" (col. 3, lines 1-2). "The magnet assembly is scanned with a reciprocating linear movement and changes direction at or near opposite edges of the target" (col. 5, 63-65).

With respect to claims 7 and 15, Morrison '688 further discloses figure 10 which has a long bar magnet on the outsides (figure 10, parts 108 and 120) with a short magnet at the ends (figure 10, parts 110, 112, 122, and 124) as a "roof". A smaller bar magnet is on the inside (figure 10, parts 130 and 132). The closed plasma loops run between the smaller bar magnets and the long bar magnets with "roofs" as evidenced by figure 11.

With respect to claims 9 and 17, Morrison '688 further depicts figure 11 having similar types of magnets (i.e. small and long magnets) that form two distinct outer

regions, with one part of the first region composing the second region and vice versa. The two regions also have an inner magnet with the outer boundary being composed of an arrangement of long and short magnet bars. Morrison '688 further depicts figure 13 having a comparable shape with the plasma tubes sharing a boundary that separates the two tubes.

However Morrison '688 is limited in that the magnets only contain 2 tubes instead of 3 tubes.

Although the reference does not disclose three tubes, it has been held that the mere duplication of parts has no patentable significance unless a new and unexpected result is produced. *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960).

Therefore it would have been obvious to one of ordinary skill in the art to duplicate the closed plasma loop any number of times in order to increase efficiency in uniform target erosion, increase film uniformity thickness onto substrate, increase overall target area sputtered, and decrease overall amount of sputtering time needed per substrate and one of ordinary skill would have a reasonable expectation of success in making the modification.

With respect to claims 10 and 18, Morrison '688 further depicts figure 10 having the outer magnets (figure 10, parts 108, 114, 116, 120, 126, and 128) as all being parallel, with parts 114, 116, 126, and 128 being shorter than parts 108 and 120. Figure 10 further depicts that the ends of the two magnets are connected with one another by an L-form magnet configuration, for example, figure 10, parts 126 and 122.

2. Claims 8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morrison, Jr. (US Patent No. 4,461,688), Lehan (WO 96/21750), and Hughes et al (US Patent No. 5,873,989) as applied to claims 7 and 15 above, and further in view of Tsukasa (JP 10,088,339).

With respect to claims 8 and 16, the references are cited as discussed for claims 1, 2, 7 and 15.

Morrison '688 depicts figure 10 as having the inner magnet a prism shape. However Morrison '688 is limited in that the entire inner magnet is of a uniform length and width instead of having a smaller diameter at its ends than its center.

Tsukasa '339 teaches an inner magnet (part 70) that has a smaller diameter at the point than in the center. The inside magnet is rectangular until reference point A1, at which the magnet becomes smaller than the center part. This enhances the availability of a target "by making the cross-sectional area of erosion in the vicinity of both edge parts in the longitudinal direction not larger than the cross-sectional area of erosion in the center part in the longitudinal direction in the cross-sectional area of erosion in the reciprocating direction of a magnet unit" (abstract).

It would have been obvious to one of ordinary skill in the art to use the inner magnets taught in Tsukasa '339 as the inner magnet for the plasma track in Morrison '688 in order to gain the advantage of improved availability of a target well known in the art and one of ordinary skill would have a reasonable expectation of success in making such a modification.

Response to Arguments

Objections

3. Applicant's amendments, filed July 12, 2007, to the drawing and specification objections are acceptable. The objections to the specification and drawing have been withdrawn. The revised drawing sheet of Figure 1 replaces the old Figure 1. The Examiner acknowledges that while the phrase "in vacuo" is acceptable, the Examiner does recognize and appreciate the correction to "in vacuum".

103 Rejections

4. Applicant's arguments filed July 12, 2007 have been fully considered but they are not persuasive.

5. On page 9, the Applicant respectfully argues that Morrison Jr. fails to teach a moving magnet system in an oscillating manner relative to the target.

The Examiner respectfully disagrees. Morrison Jr. is combined with Hughes et al for the motivations as given previously. Hughes et al teaches "a magnet assembly disposed in proximity of the target" (abstract) and "a drive assembly for scanning (i.e. moving) the magnet assembly relative to the target" (abstract). Furthermore, Hughes et al discusses how the magnet assembly (part 24) is scanned with a reciprocating (i.e. oscillating) linear movement and changes directions at or near opposite edges (part 26 and 28) of the target (col. 5, lines 60-65; figures 1-3).

6. On page 9, the Applicant respectfully argues that Morrison Jr. does not disclose two regions of a plasma tube.

The Examiner respectfully disagrees since Morrison Jr. teaches "a closed plasma loop [...] for trapping plasma between the first and second magnetic field domes" (abstract), as stated in the Office Action dated April 12, 2007. Thus the closed plasma loop is a plasma tube. Figure 5 also does depict two regions of a plasma tube as evidenced by [48] and, [50] and [52] present on both the right and left sides.

7. On page 10, the Applicant respectfully argues that Lehan teaches a magnet system movement of rotating instead of linear.

The Examiner respectfully disagrees since Lehan is used solely to depict an oval plasma racetrack parameters and not a moving magnet system.

8. On page 10, the Applicant respectfully argues that the figures 2B and 2C of Lehan refer to different dimensions and that "W_L" and "W_e" are different. In addition, Morrison Jr. does not teach a plasma tube along with the claimed parameters "d", "B", "C", and the path "W".

The Examiner respectfully disagrees. The Examiner admits that in figure 2B, "D_p" is indeed, not equal to "B/2". However the Examiner cites this misrepresentation on figure 2B, where "D_P" is seemingly split in half by the arrow of "W_e" and is essentially two parts. However the Examiner submits that this was an error and not intended to be malicious or deceitful but was in fact a simple mistake. Therefore the Examiner amends the previous statement that "D_P" is equal to "B/2" with the statement "D_P" is equal to "B", thus "B/2" is equal to "$D_p/2$". In addition, the Applicant admits that "d" always has the same dimension. Lehan states that "W_L" and "W_e" can also be the same dimension as evidenced by p.9, lines 1-8.

9. On page 12, the Applicant respectfully argues that Morrison Jr. does not teach the claimed parameters "B" and "$B \leq 2d$" for the path "(=W)>C", nor does Lehan or the combination of Lehan and Morrison Jr.

The Examiner respectfully disagrees. There is no evidence for "W" anywhere in the Applicant's claims, specification, or drawings. In addition, since Lehan depicts in figures 2B and 2C that "D_p" (or "D_{en}") is equivalent to "B" and that "W_L" is equivalent to "d", "$B \leq 2d$" is equivalent to "$D_p \leq 2W_L$" (or "$D_{en} \leq 2W_L$").

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Band whose telephone number is (571) 272-9815. The examiner can normally be reached on Mon-Fri, 8am-4pm, EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

12. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MAB

ALEXA D. NECKEL
SUPERVISORY PATENT EXAMINER